REMARKS

These remarks are respectfully submitted in response to the Office Action mailed July 14, 2006. Reconsideration of Applicants' presently claimed invention is respectfully submitted in light of the present remarks.

Applicants respectfully submit that the claimed term "coefficients" has not been fully appreciated. For convenience, the following is an excerpt from the definition of "coefficient" excerpted from Wikipedia.

From Wikipedia, the free encyclopedia

> "In mathematics, a coefficient is a constant multiplicative factor of a certain object. The object can be such things as a variable, a vector, a function, etc. For example, the doefficient of $9x^2$ is 9. In some cases, the objects and the coefficients are indexed in the same way, leading to expressions such as
>
> $$a_1x_1 + a_2x_2 + a_3x_3 + \ldots$$
>
> where a_n is the coefficient of the variable x_n for each $n = 1, 2, 3, \ldots$
>
> In a polynomial P(x) of one variable x, the coefficient of x^k can be indexed by k, giving the convention that for example
>
> $$P(x) = a_kx^k + \ldots + a_1x^1 + a_0$$
>
> For the largest k where $a_k \neq 0$, a_k is called the ***leading coefficient*** of *P* because most often, polynomials are written from the largest power of x, downward (i.e. $x^5 + x^4 + x^2 \ldots$)."

In the above quote, the function for x includes different coefficients a_k, a_1 and a_0, all of which can be used when solving for x when one has the correct coefficients and the function which defines how the variables are used, e.g. in the cited example, $x^5 + x^4 + x^2 \ldots$, then one can solve the function for any given value of variable x. Thus the

coefficients are constant multiplicative factors for a variable or a function.

On page 8 of Applicants' pending application, in paragraph [0036] Applicants describe use of the NTSYSPC program (Exeter software) which uses an elliptical Fourier analysis program to generate a series of best fit curves to the coordinate data using harmonics. This is just one example of Applicants' claimed invention. According to this example, the following functions for the harmonics are used:

$$x(t) = \sum_{k=1}^{N} \left(A_k \cos \frac{2\pi kt}{T} - B_k \sin \frac{2\pi kt}{T}\right)$$

$$y(t) = \sum_{k=1}^{N} \left(C_k \cos \frac{2\pi kt}{T} - D_k \sin \frac{2\pi kt}{T}\right)$$

T = Total length of the outline approximated by the line segments between the landmarks.
$t = 0$ to 2π, based on t the x and y coordinates can be determined
A_k, B_k, C_k, D_k, are the coefficients for each harmonic, $k = 1, 2, 3, \ldots, N$ (where N is total number of harmonics)

Therefore, the functions for harmonic 1 are:

$$x(t) = A_1 \cos \frac{2\pi t}{T} - B_1 \sin \frac{2\pi t}{T}$$

$$y(t) = C_1 \cos \frac{2\pi t}{T} - D_1 \sin \frac{2\pi t}{T}$$

and the functions for harmonics 1-3 are:

$$x(t) = A_1 \cos \frac{2\pi t}{T} - B_1 \sin \frac{2\pi t}{T} + A_2 \cos \frac{4\pi t}{T} - B_2 \sin \frac{4\pi t}{T} + A_3 \cos \frac{6\pi t}{T} - B_3 \sin \frac{6\pi t}{T}$$

$$y(t) = C_1 \cos \frac{2\pi t}{T} - D_1 \sin \frac{2\pi t}{T} + C_2 \cos \frac{4\pi t}{T} - D_2 \sin \frac{4\pi t}{T} + C_3 \cos \frac{6\pi t}{T} - D_3 \sin \frac{6\pi t}{T}$$

While these are the functions for harmonic 1 and harmonics 1-3[1], the focus of Applicants' claims is on the coefficients of the function utilized, i.e., A_1, B_1, A_2, B_2, A_3, B_3 in the example of harmonics 1-3. U.S. Patent 5,740,266 to Weiss, et al, discloses an image processing system and method which provides an example said to be useful in screening fetal skulls for indications of spina bifida and indicates that a negative radius of curvature is an indicator of the probability the fetus being affected. Weiss generally teaches a method utilizing a number of steps. The first step involves the use of a number of succeedingly more accurate masks to remove clutter around the image of the observed shape by iteratively changing the shape of each mask to form a more accurate outline of the imaged objected, e.g., fetal skull. Weiss then teaches,

> "In order to use this risk assessment technique to evaluate the shape of an object in a medical image in accordance with present invention, **a single numerical value** that characterizes the shape of the desired object is produced." (See column 5, lines 26-30). (emphasis added)

Weiss teaches determining the radius of curvature for each point on the outline, and taking the inverse of the radius of curvature to arrive at, what Weiss refers to as "curvature". After determining a "curvature" value for each point on the object outline, the curvature values are further processed to produce **a single numerical value that characterizes the degree to which a particular shape characteristic is present in the curve or outline** (see column 5, lines 40-52).

[1] As noted in Applicants' specification in ¶ [0036], in general, the more harmonics used, the better the fit to the coordinates.

The formula for radius of curvature does not rely upon coefficients. The following is an excerpt of the radius of curvature formula taken from Wolfram Math World and is available at http://mathworld.wolfram.com/RadiusofCurvature.html.

Radius of Curvature

The radius of curvature is given by

$$R \equiv \frac{1}{|\kappa|}, \tag{1}$$

where κ is the curvature. At a given point on a curve, R is the radius of the osculating circle. The symbol ρ is sometimes used instead of R to denote the radius of curvature.

Let x and y be given parametrically by

$$x = x(t) \tag{2}$$
$$y = y(t), \tag{3}$$

then

$$R = \frac{(x'^2 + y'^2)^{3/2}}{|x' y'' - y' x''|}, \tag{4}$$

where $x' = dx/dt$ and $y' = dy/dt$. Similarly, if the curve is written in the form $y = f(x)$, then the radius of curvature is given by

$$R = \frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}}{\left|\frac{d^2 y}{dx^2}\right|}. \tag{5}$$

In polar coordinates $r = r(\theta)$, the radius of curvature is given by

$$R = \frac{(r^2 + r_\theta^2)^{3/2}}{|r^2 + 2 r_\theta^2 - r r_{\theta\theta}|}, \tag{6}$$

where $r_\theta = dr/d\theta$ (Gray 1997, p. 89).

There is no teaching or suggestion to use "coefficients" in this formula. There is also no teaching or suggestion in Weiss, et al to utilize coefficients from this formula. To the contrary, Weiss specifically teaches reducing a plurality of different curvature values to produce "a single numerical value that characterizes the degree to which a particular shape characteristic is present in the curve or outline" (see column 5, lines 48-52).

Applicants also respectfully request careful reconsideration of the italicized paragraph on the top of page 3 in the outstanding Office Action. While Weiss teaches taking the inverse of the radius of curvature to produce a "well behaved function," he never teaches use of "coefficients". Each radius of curvature determined by Weiss for each point along the curve is an actual value and each inverse of such values are themselves distinct values. Weiss never teaches or suggests that the "curvatures" which he calculates from the radii of curvature and which are processed to produce a "single numerical value" are coefficients to some other variable or function. On the contrary, they are each essentially free standing, discrete values corresponding to each point on Weiss' curve. By reducing all of Weiss' curvature values to "a single numerical value" which Weiss then utilizes to "determine a single figure of merit", Weiss method is clearly contrary to and neither teaches nor suggests Applicants' claimed use of at least one coefficient, since none of Weiss' values are "coefficients" as that term would be understood by one who had skill in the art.

In the "response to arguments" appearing on page 6 of the outstanding office

action, the office action states:

> "... the measured curvature values of the skull around the circumference serves as coefficients in the inverse determination ..."

Applicants respectfully submit that taking the inverse of a value is a process which simply determine an inverse value, but does not teach the use of either the "radii of curvature" or the "curvature values" as "coefficients". The suggestion in the office action that the "measured curvature values may properly be called a curvature coefficient since they are a numerical factor which multiplies the measured curvature radius ... to create a smooth inverse curve" in unsupported.

Applicants respectfully submit that Weiss, et al has not been fully appreciated. There is no teaching or suggestion in Weiss, et al to multiply each radius of curvature with the "curvature" values. As noted on the top of page 3 of the office action, this exercise would always result in a value of "1" which would render all forms of measurement the same.

While Weiss and other cited references use fetal measurements in calculations to calculate a risk probability of a fetal abnormality, there is no teaching or suggestion in Weiss, et al to determine one or more coefficients of one or more mathematical functions that describe the identified shape and then utilizing the determined "one or more coefficients" as markers to assess fetal abnormality, as claimed.

Each of the rejections under 35 U.S.C. §103 rely primarily upon the teaching of

Weiss, et al in combination with another reference. Since, as noted above, Weiss, et al fails to teach or suggest Applicants' invention as claimed in each of independent claims 1, 25 and 26, and since all dependent claims are dependent, either directly or indirectly upon claim 1, each of these claims are also properly allowable.

REQUEST FOR INTERVIEW

Applicants respectfully request a brief telephone interview between Examiner Francis Jaworski and Applicants' representative, Mr. Burke, after the examiner has considered the present response.

REQUEST FOR EXTENSION OF TIME

Finally, Applicants hereby request a one-month extension of time to respond to the outstanding Office Action. PTO-2038 form in the amount of $ 120.00 is enclosed herewith for the official fee associated therewith.

CONCLUSION

Applicants respectfully submit that all pending claims, are in condition for allowance. If the Examiner has any questions or comments which might expedite the prosecution of the present application, he is respectfully invited to contact Applicants' attorney at the phone number set forth below.

Respectfully submitted,

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